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The Journal of HEREDITY

A monthly publication devoted to Plant Breeding Animal Breeding and Eugenics

Maize Used as Decoration by Aztecs

(See "Maize and Man," P. 33)

Inheritence of Intelligence

The "Dual" Orange

FEBRUARY, 1926 Vol. 17, No. 2

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The

Journal of Heredity

Vol. XVII, No. 2 February, 1926

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The JOURNAL OF HEREDITY is published monthly by the
AMERICAN GENETIC ASSOCIATION

At 1918-32 Harford Avenue, Baltimore, Md., and
Victor Building, Washington, D. C.

Address communications regarding editorial matters and the business management of the Association to Room 306, Victor Building, Washington, D. C.

Entered as second class matter February 24, 1923, at the post office at Baltimore, Maryland. Acceptance for mailing at the special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized December 20, 1918. Contents copyrighted 1926 by the American Genetic Association. Reproduction of articles or parts of articles permitted only upon request, for a proper purpose, and provided due credit is given to the author and to the JOURNAL OF HEREDITY, Washington, D. C.

Date of Issue of This Number, March 25, 1926

$3.50 a Year; 35c the Copy

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PREHISTORIC VASES DECORATED WITH MAIZE

Frontispiece

Pre-Inca burial vases from very ancient graves, Chimbote, Peru. The use of corn as a decorative motif emphasizes the importance of this plant to the Ancients and incidentally furnishes an illustration of the ears of corn as they were known to the people who inhabited Peru before the Incas.

MAIZE AND MAN

J. H. KEMPTON

(Courtesy of W. E. Safford)

AN AZTEC CEREMONIAL URN

Figure 1

A terra cotta vessel showing replicas of highly developed ears of corn. These furnish a convincing demonstration of the excellence maize had attained in very early times.

ASTRONOMICAL and archaeological researches are accepted generally as having a value quite apart from any contribution they may make to material welfare. But that investigations can be prosecuted in the sciences of chemistry, physics, and biology without the incentive of an immediate financial return is not so well understood.

In the sciences as in the arts "pot boiling" is not unknown, but the typical investigator in choosing an organism for the solutions of biological problems gives chief consideration to its suitability for the particular studies in contemplation. Thus it happens that specialists are delving into the mysteries of growth and reproduction not only on those forms of life of economic

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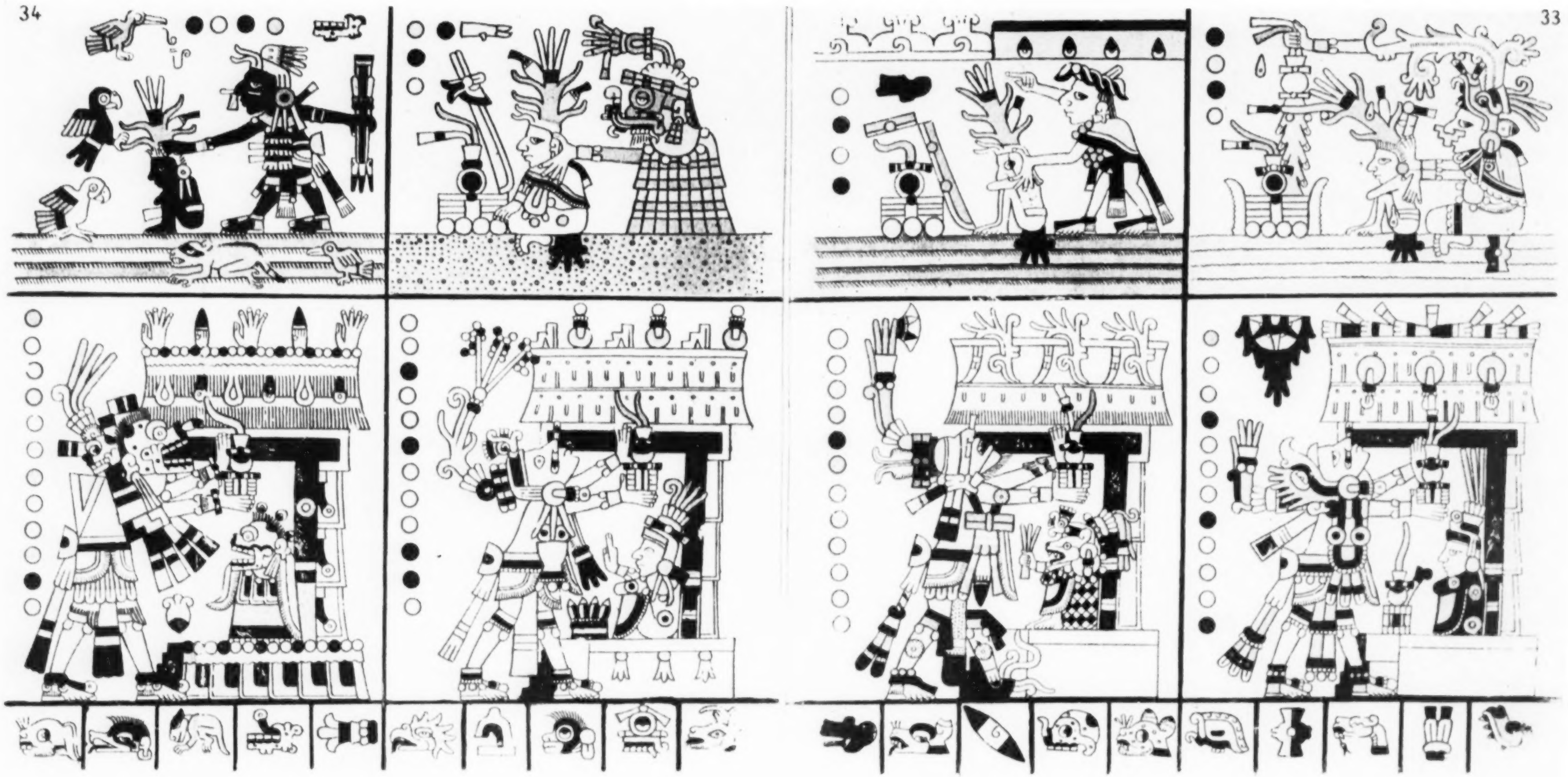


AN AZTEC MAIZE ALMANAC

Figure 2

Illustrations of maize from an Aztec codex showing the season's history of the maize plant from the planting to the harvest. Note particularly that the Aztec had to contend with the birds of the air and the beasts of the field for the product of his labors. From the character of the head dress of the second figure from the left on the lower tier it seems possible that the Aztec recognized the production of pollen as a feature of the growth of maize. The termination of the head dress of this figure suggests pollen grains adhering to a highly conventionalized tassel. Maize pollen may well have formed an article of diet to the Aztecs as it does to some of the Indians of the Southwestern United States at the present day.

(Codex Tejervary Mayer pp. 33-34)

MAIZE IN MAYA ART

Figure 3

A clay whistle made by the Maya Indians of Central America. The Mayas reached a very high degree of culture and may have played an important part in the development of maize.

(Fig. from Theobert Maler, Explorations of the Upper Usumatsintla and adjacent region. *Mem. Peabody Mus. Am. Arch. and Eth.* Vol. IV, No. 1, p. 36, 1908.))

importance but also on others that have no material value.

When the objects of these studies chance to be plants or animals of agricultural value it is generally taken for granted that increased production must be the desideratum. However, though the discovery of a means to increase production always is welcome, the incentive for continued investigation usually is the solution of problems only remotely, if at all, connected with increased yields.

At the present time many broad biological problems are being studied through the medium of that most characteristic plant of our agriculture, Indian corn.

Perhaps no plant is more familiar to thousands of people as they motor into the country than this gigantic grass. There is hardly a section within the confines of these United States where it is possible to travel a hundred miles without passing fields of this crop. South of the United States to the Argentine, through Mexico, Central America, Peru, and Chile corn is even more prominent.

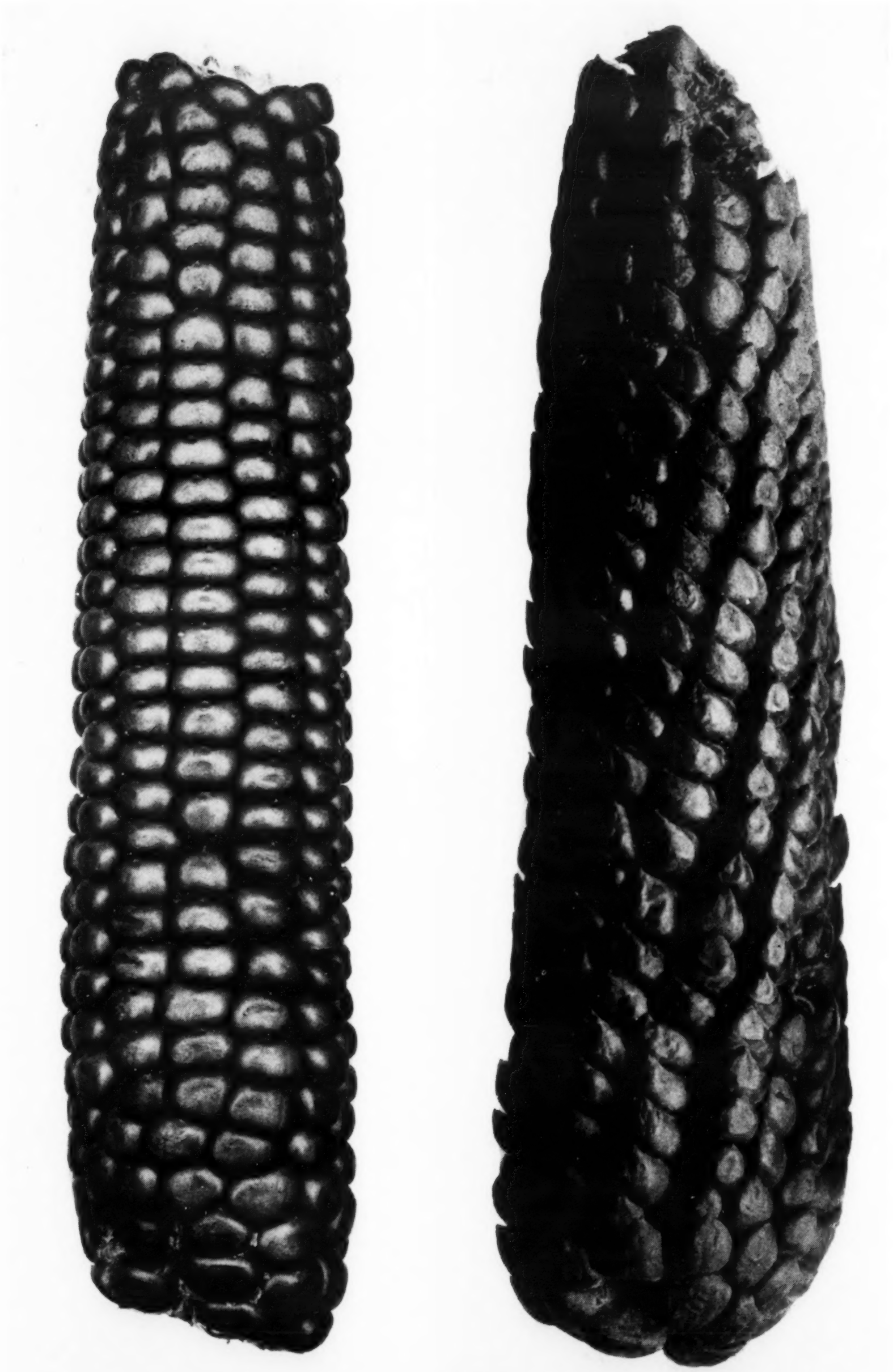
Here, then, is a crop plant, the basic food of the people of two continents, cultivated by the earliest inhabitants of the Americas for untold centuries and the object of intensive investigations by many specialists, but taken very much as a matter of course by the countless thousands whose heritage it is.

Origin a Mystery

And yet, this commonest of cultivated plants, on which depends the prosperity of a large part of the population of the Western hemisphere, presents one of the most intriguing mysteries of the New World.

Whence came this plant? What of its history, for every cultivated plant has a history however brief? What of its origin, for every plant has an ancestry and a host of relatives, however poor? What of its future, for every crop has a future, however uncertain?

Of written history the record is brief as measured by the probable length of time maize has been under cultivation. The earliest reports show a distribution not essentially different from that of the present time. Five centuries ago maize had been perfected to a degree of excellence not yet surpassed. The common forms of maize as known to us, sweet, pop, and field or horse corn, were all in existence and widely distributed when Columbus landed. Written history, then, can teach us little more than that corn was grown by the Indians. Fortunately history is not limited to written records. Archaeological exploration and excavation clearly demonstrate that the three most elaborate civilizations developed on this hemisphere, Inca, Maya, and Aztec, were all supported by maize. To all these people the plant was of sufficient importance to merit the be-



(Courtesy of G. G. Heye) *(Courtesy of W. E. Safford)*

PREHISTORIC EARS OF MAIZE

Figure 4

An ear of corn from Indian graves at Cave du Pont Utah is shown at the left. The Indians who grew this specimen are known as Basket-makers and preceded the ancient Cliff-dwellers. This ear is shown natural size and is the property of the museum of the American Indian, Heye Foundation, New York. The ear at the right was excavated from Pre-Inca graves in Peru. Both of the ears compare very favorably in size with those grown at the present time.

Arica Ear Fossil Ear

FOSSIL AND PREHISTORIC MAIZE

Figure 5

Fossil ear of maize at the left and a pre-Inca ear exhumed from a grave in Tacna-Arica. The fossil ear was purchased from a collector of curios in Cuzco, Peru, in 1914 and though the actual location of the place where it was first found is not known the specimen affords the first tangible evidence of the geological existence of maize. In many characteristic this fossil resembles the ear excavated in Tacna-Arica as well as varieties grown today in Peru and Bolivia.

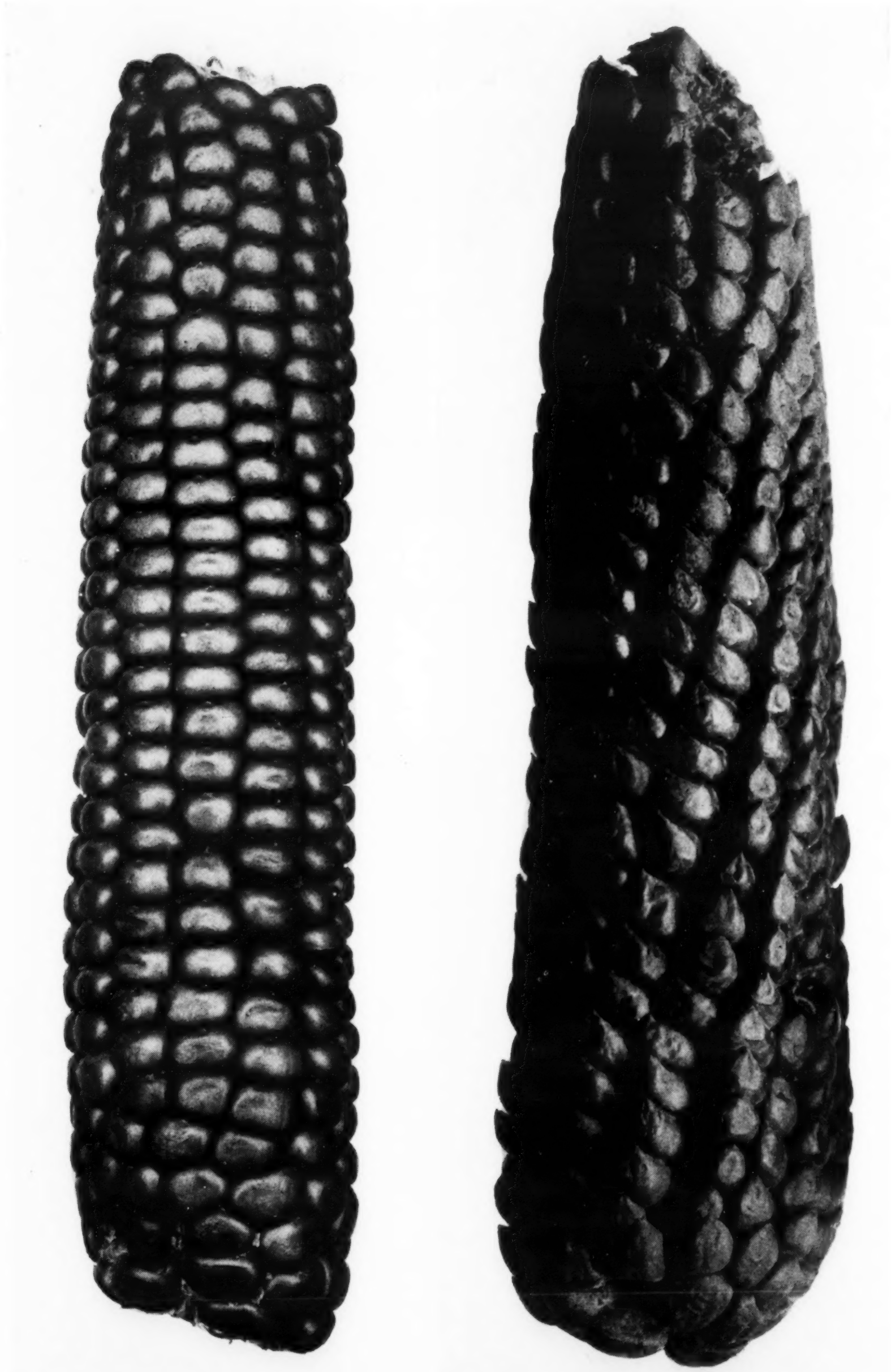
lief that it was a gift from the gods, to be accorded the respect and care that such gifts deserve. In at least one instance, that of the Maya, the decline and fall of civilization was concomitant with and probably caused by the decline in production of maize.

Maize formed the foundation of intricate ceremonies and religious rites, some of which, in the light of our present imperfect knowledge, seem beneficial while others apparently were positively harmful to the crop. In many places the planting and harvesting were conducted with elaborate rituals for the life of the people depended upon the productivity of this plant. The gods of corn enjoyed a prestige not surpassed by those of rain and war and were regarded with affection rather than fear. But beyond the belief that maize was a direct gift of the gods neither history nor archaelogy has given us a clue as to its origin. Well developed ears of corn are found in the excavations of the earliest peoples whether in North or South America, this wide distribution placing its domestication at a very remote period indeed.

At this point direct historical evidence ceases and recourse must be had to the botanical sciences to pursue the mystery further.

Botanical Evidence

For the botanist two main lines of approach to the problem are available. Where do the relatives of maize occur and in which region is the greatest specialization of types? The answers to these questions are known, but they



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complicate rather than simplify the problem. The closest relatives of maize are in North America though the greatest specialization of the plant occurs in Peru, that center of domestication of so many plants. In Peru also a fossil ear of maize has been found, and were it not for the absence of close relatives in South America the botanist unhesitatingly would give the credit for the domestication of this plant to the Incas or their predecessors. But the lack of relatives or ancestors is a serious stumbling block, since in developing a new plant it is necessary to have something, however unpromsing, with which to start. This brings us to another baffling point in the origin of maize. Even its closest relatives are so much unlike the finished product as to raise grave doubts whether the most patient of breeders could develop maize from its assumed ancestors.

Present-day breeders, in developing new or improved plants, start with a conception of the end product and select unremittingly toward that ideal. But even the most audacious breeders would hesitate to undertake to develop a plant like maize from its existing relatives, granting that the ideal could be visualized. But that the maize plant as we know it and as it has been known for thousands of years could have been visualized from the characteristics of its nearest relatives is beyond belief. Neither does it seem reasonable to suppose that propagating the more desirable individuals of these relatives would have given rise by chance to the plant we know as maize.

We have no reason to believe that the grasses most nearly related to

(*Courtesy of G. G. Heye*)

COBS FROM OZARK CAVES

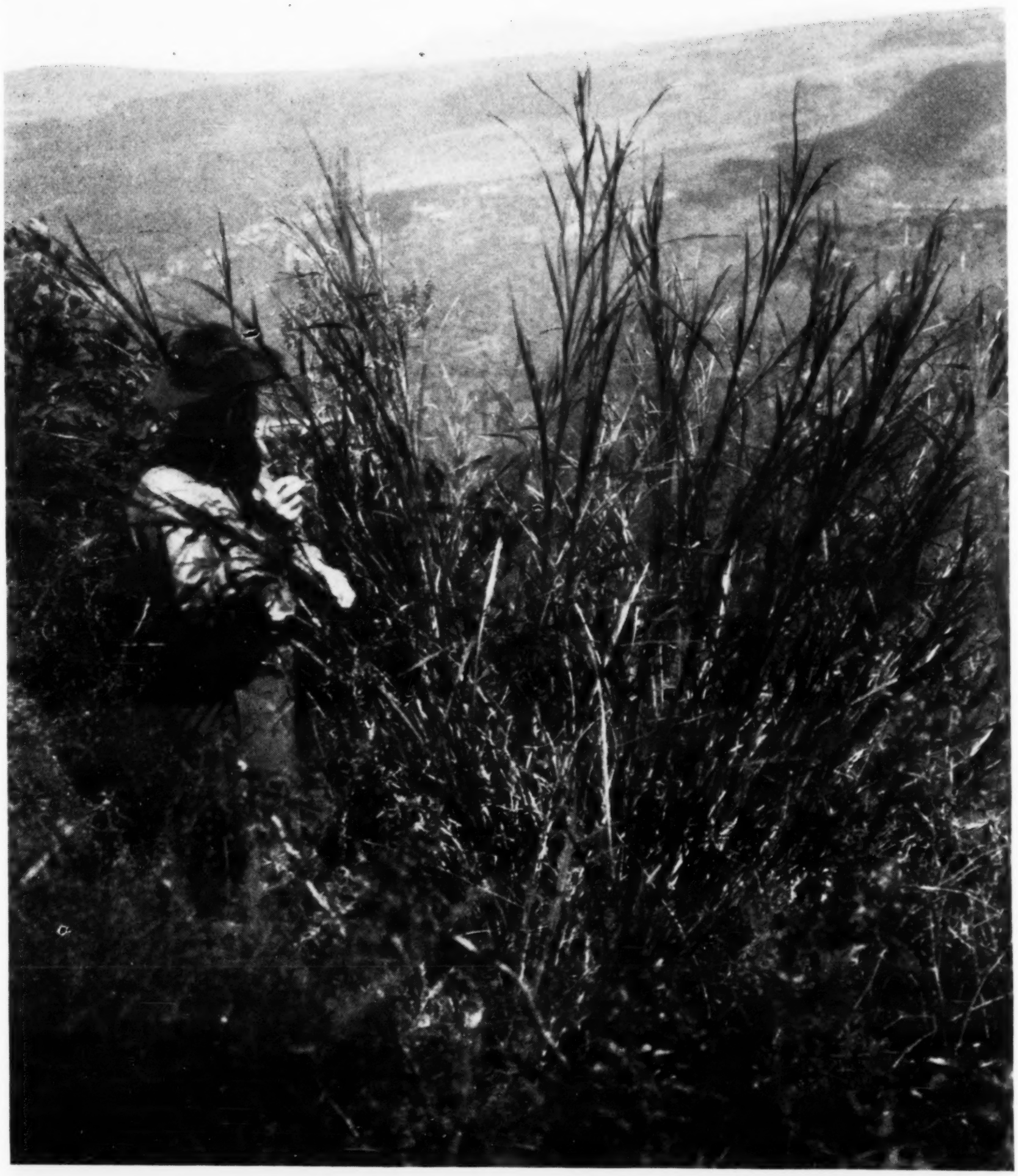
Figure 6

The people inhabiting these caves preceded the Indians found in the present United States by the early settlers. The exact period of their occupancy is not known but the evidence indicates that they antedated the mound builders. The specimens shown natural size, are the property of the Museum of the American Indian, Heye Foundation, New York.

A NORTH AMERICAN COUSIN OF MAIZE

Figure 7

The inflorescence and section of a leaf and an insert of the "seeds" of *Tripsacum pilosum,* natural size. There are several species of Tripsacum indigeneous to Mexico and Guatemala. The "seeds" are produced at the base of the tassel as sections of the branches of the inflorescence are extremely hard. The actual seed with the nourishing material is enclosed by the hard outer covering.



A REMOTE ANCESTOR OF MAIZE

Figure 8

A plant of Gama Grass (*Tripascum lanceolatum*) growing in Mexico on the banks of a deep canyon, the usual habitat for these maize relatives.

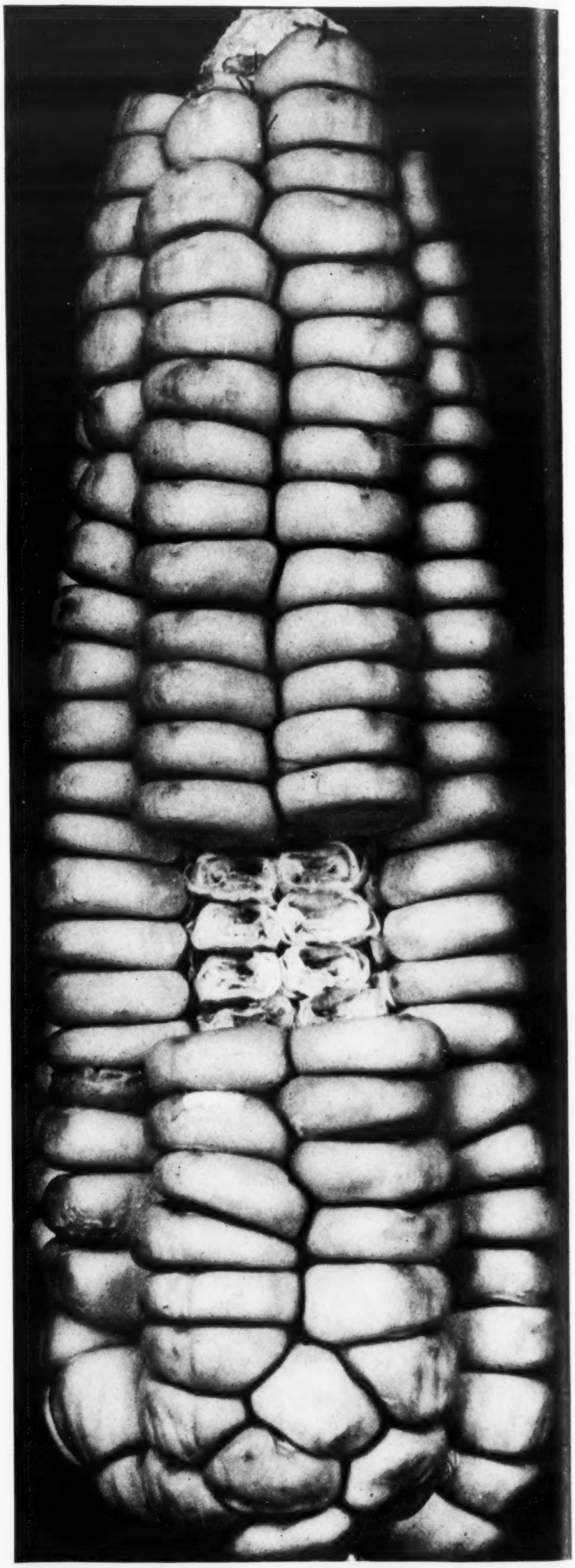
RELATIVES OF MAIZE

Figure 9

The plant on the left is the annual teosinte (*Euchlaena mexicana*), in its natural habitat of Northern Mexico. Teosinte is a wild grass having many of the characteristics of maize, although it is very far, indeed, from the maize plant of our agriculture. An "ear" of teosinte is shown in Figure 11. The name teosinte is derived from the two Aztec words "teo-centli" meaning "God Grass," and is supposed to have reference to the divine origin of this plant. The plant on the right is a more remote Mexican ancestor of maize, sometimes called Gama Grass (*Tripsacum pilosum*).

maize were of the slightest value as a source of human food to the ancients. In the first place their characteristics are such as to render the extraction of carbohydrates very laborious and to obtain seed in any quantity an almost daily harvest would be required.

Secondly, other more promising wild plants were available but were never adopted, and lastly there is no evidence that maize relatives were used for food even in time of scarcity.

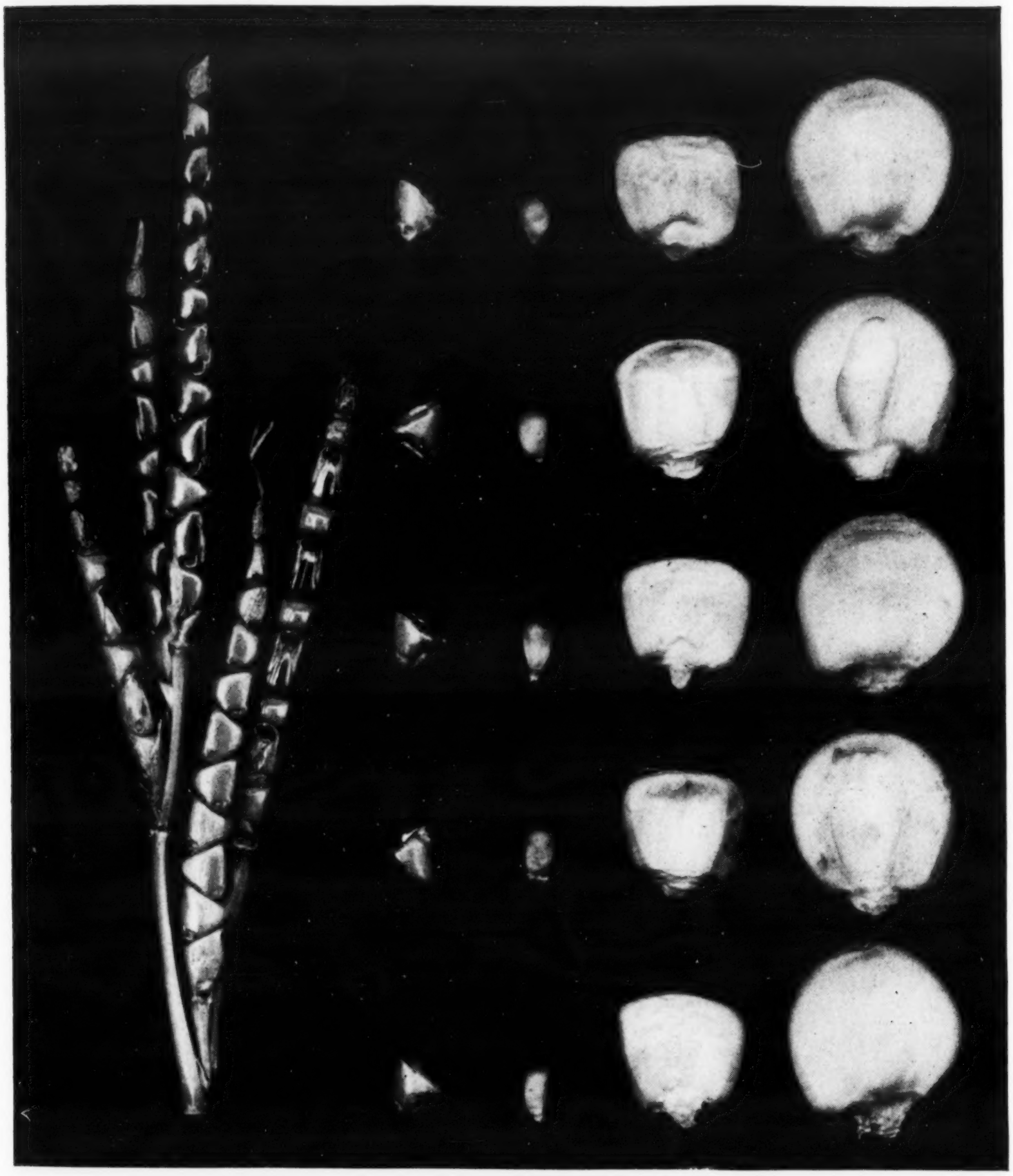


LARGEST PLANTS AND GRAINS

Figure 10

Jala maize has the largest plants of any known variety, and the stalks are used for fences. This variety has been grown by the Indians on the West Coast of Mexico for an unknown length of time.

Cuzco maize, a Peruvian variety, of which an ear is shown here, natural size, represents the most extreme development in seed size. The seeds are boiled and then eaten one at a time like grapes.



SEEDS OF MAIZE AND OF TEOSINTE

Figure 11

At the left is an inflorescence of teosinte from which the husks have been removed to show the character of the seeds. Each spike of this inflorescence corresponds to an entire ear of corn. When ripe the spikes are very brittle and the extremely hard "seeds" are easily separated. Such seeds are shown in the adjoining row. Pop corn has the smallest seeds of any type of maize, and those in the center row are from Peru. Next to them on the left are grains of Jala maize. The right hand row shows grains of Cuzco, also a Peruvian variety. (Natural Size.)

Maize Developed by Man

But the plant was developed and by common consent man played a major part in its improvement. Just how its development was brought about is a mystery, and a subject for lively discussion. The formal botanical school, true to its conservative viewpoint and secure in its knowledge of the development of other cultivated plants, holds that maize developed gradually by minute changes in the characteristics of its ancestors, being aided in the later stages by man. Disregarding the botanical evidence opposed to this conception there are difficulties of an anthropological nature. Anthropologists

DWARF AND NORMAL CORN PLANTS

Figure 12

The dwarf plants shown here differ from the normal in size and in a number of other ways. Nevertheless only a single hereditary factor or gene is involved in each of these abnomalities. The defects are complementary in nature, for when the two dwarfs are crossed the plants of the first generation are fully as tall as the normal corn plant.

A BRANCHED EAR OF MAIZE

Figure 13

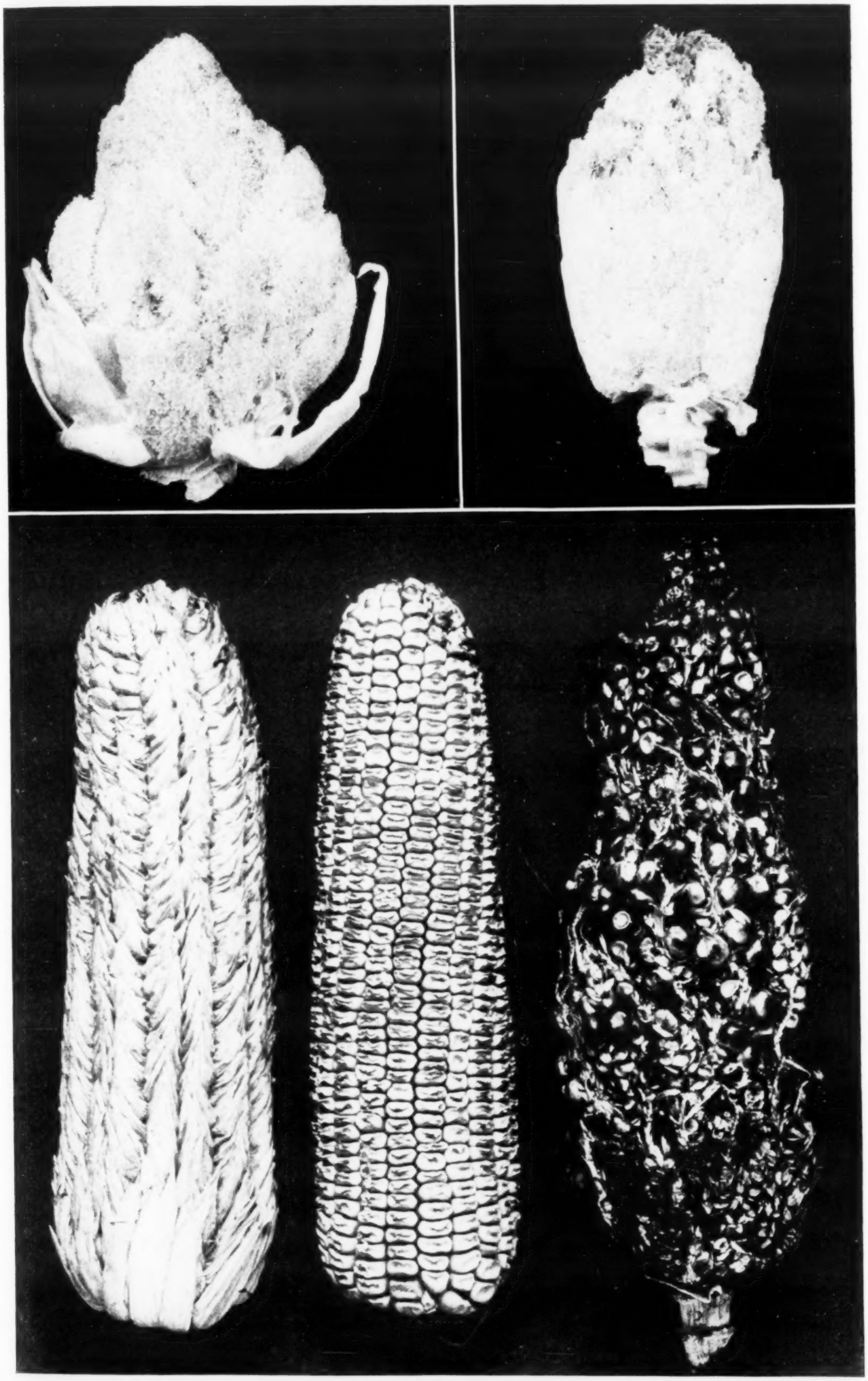
Branched ears are common in maize and several distinct types are known. The form here shown natural size, though inherited, is very sensitive to environmental conditions and its appearance cannot be predicted with the certainty possible with most other characters.

ATAVISTIC TYPES

Figure 14

Tassels of pod corn (right) and of tassel seed (left), two inherited abnormalities of maize showing the development of silks. Such plants seldom produce ears, the seeds being borne in the tassel. Variations such as these are known as atavisms—a return to an ancestral condition with respect to certain characters.

"Cauliflower" Ears



Pod Corn Normal Ear Ramose

INHERITED ABNORMALITIES OF MAIZE

Figure 15

Pod corn is so called because each seed is enclosed in well developed glumes, the whole ear being enclosed in husks as in normal corn. Ramose is a variation in which the ear is a much ramified inflorescence, the seeds being borne on branches instead of on the central axis of the cob. The combination of pod and ramose gives in the second generation the "cauliflower" ears shown natural size at the top of the plate. These ears are completely sterile.

and archaeologists are agreed that there is no absolute evidence that man was present on the Western hemisphere in very remote times, arriving perhaps not more than 10,000 years ago. Archaeological and geological evidence strongly indicate that during at least half of this period maize existed in its present high degree of specialization. No intermediate stages between maize and its relatives have been found even in the earliest burial cists. To adopt the viewpoint of the conservative school we would be obliged to suppose that the beginnings of maize were initiated by man but were not preserved by him. Further we would have to credit man of 10,000 years ago with the ability to produce the plant from very unpromising material as well as disseminate it over two continents in about 5,000 years.

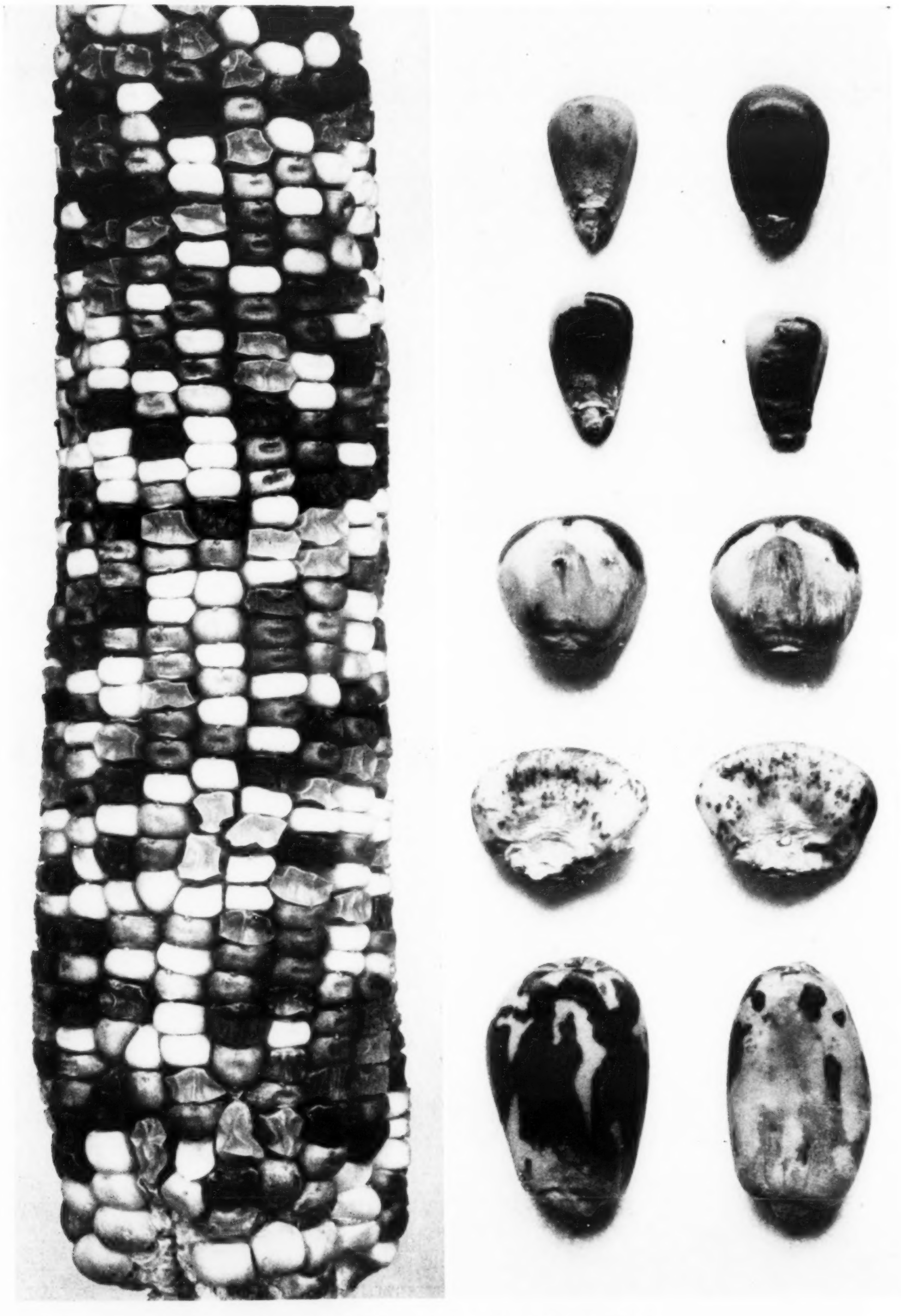
Another botanical school impressed with the morphological novelties of maize has resorted to the hypothesis of hybridization. This school presents the theory that maize arose as a hybrid between its recognized relatives and some other grass at present unknown. This hypothesis offers the attractive possibility that the hybrid can be produced again when the proper parents are crossed and in addition it provides for a more rapid origin than is possible on the theory of gradual evolution.

Whichever hypothesis is found best to fit the facts, there can be no question that maize has been under cultivation for thousands of years in essentially its present form. Having a past of at least five thousand years what can we prognosticate for its future? Only within the last half century and perhaps more accurately only within

ADHERENT—A HERITABLE VARIATION

Figure 16

In this peculiar variation the upper leaves and tassel branches are firmly "glued" together and the contortions of the stalk are brought about by mechanical stresses developed in elongation. The inheritance of this abnormality is quite simple.



SEED CHARACTERS OF MAIZE

Figure 17

The ear of corn at the left shows some of the more common seed characters (natural size). Heritable characters such as these, reared in large numbers under uniform conditions, enable geneticists to formulate the laws of heredity. The seeds of maize at the right (enlarged to twice their natural size) show five types of aleurone color. By analysis of the results of hybridizing seeds of this sort with those of the commercial varieties, which have no color in the aleurone cells, it has been possible to establish the regularity of the compicated numerical proportions of the several classes.

the last twenty-five years has an active, organized effort been made to improve the crop still further. That improvement can be effected seems certain, though no very marked increases in yields over our present best varieties are to be expected. The prospect of larger yields represents what might be called the materialistic future of the crop, but what might be called the "intellectual future" of maize is perhaps more brilliant.

The Intellectual Future of Maize

Students of the laws of heredity, unharrassed by the vapid preachings of the loquacious ignorant, continue their investigations with organisms least likely to arouse opposition. No one, however militantly opposed to ideas of heredity as applying to man, objects to the improvement of plants and animals, or even denies that a thorough knowledge of the laws underlying the inheritance of characters is necessary. And these basic principles, worked out with the lower orders, eventually may be applied to man himself when the facts are better established and more clearly understood.

Few, other than the initiated, appreciate the fundamental discoveries now being made in the study of heredity—discoveries to which investigation of the maize plant has made no small contribution. The definite determination of questions that depend upon the regularity of the proportion in which characters are represented in succeeding generations requires the detailed analysis of results derived from a study of a large number of individuals. In this respect the seeds of maize offer unusual opportunities. Instead of a single offspring or a few, from 400 to 800 seeds result from a single application of pollen and the technique of hybridization is very simple. In addition to the ease of manipulation and the relatively large numbers obtained, maize seeds offer the advantage of several alternative characters which permit rapid and accurate classification. These advantages are augmented further by a large number of mature plant characters.

To the casual observer all maize plants look very much alike though to the specialist hundreds of variations from the normal are known, and what is of even more importance the mode of inheritance of most of these teratological forms is well understood. New forms, once isolated, can be combined, by means of hybridization, with each other and with the normal type. They can be kept in concealment for unlimited generations or brought forth at will, like rabbits in the hands of an expert in legerdemain.

Further still, it has been found that characters tend to be inherited in groups, making it possible in many cases to predict just what proportion of individuals, in any given population, will possess a certain complex of characters.

But what has this to do with man? Only this as yet, that the laws of heredity worked out in the study of the transmission and reappearance of characters in corn, are also the laws that govern the transmission and reappearance of characters in other plants, in several different orders of insects and other animals and apparently in man himself, in so far as the peculiarities of mating in man have permitted a definite analysis.

A recent and very remarkable advance in the knowledge of the mechanism of heredity is that of establishing where the characters or their determiners are carried in the germ cells. Both in plants and insects it has been found by very careful analysis of the results of experiments that the number of groups of characters that tend to be inherited together correspond to the number of microscopic bodies in the cells of these organisms, known as chromosomes. The inference is that the relationship of the groups of characters to the number of chromosomes is more than a mere coincidence and detailed experimental evi-

dence clearly indicates that the chromosomes are the bearers of the ultramicroscopic determiners of the characters themselves.

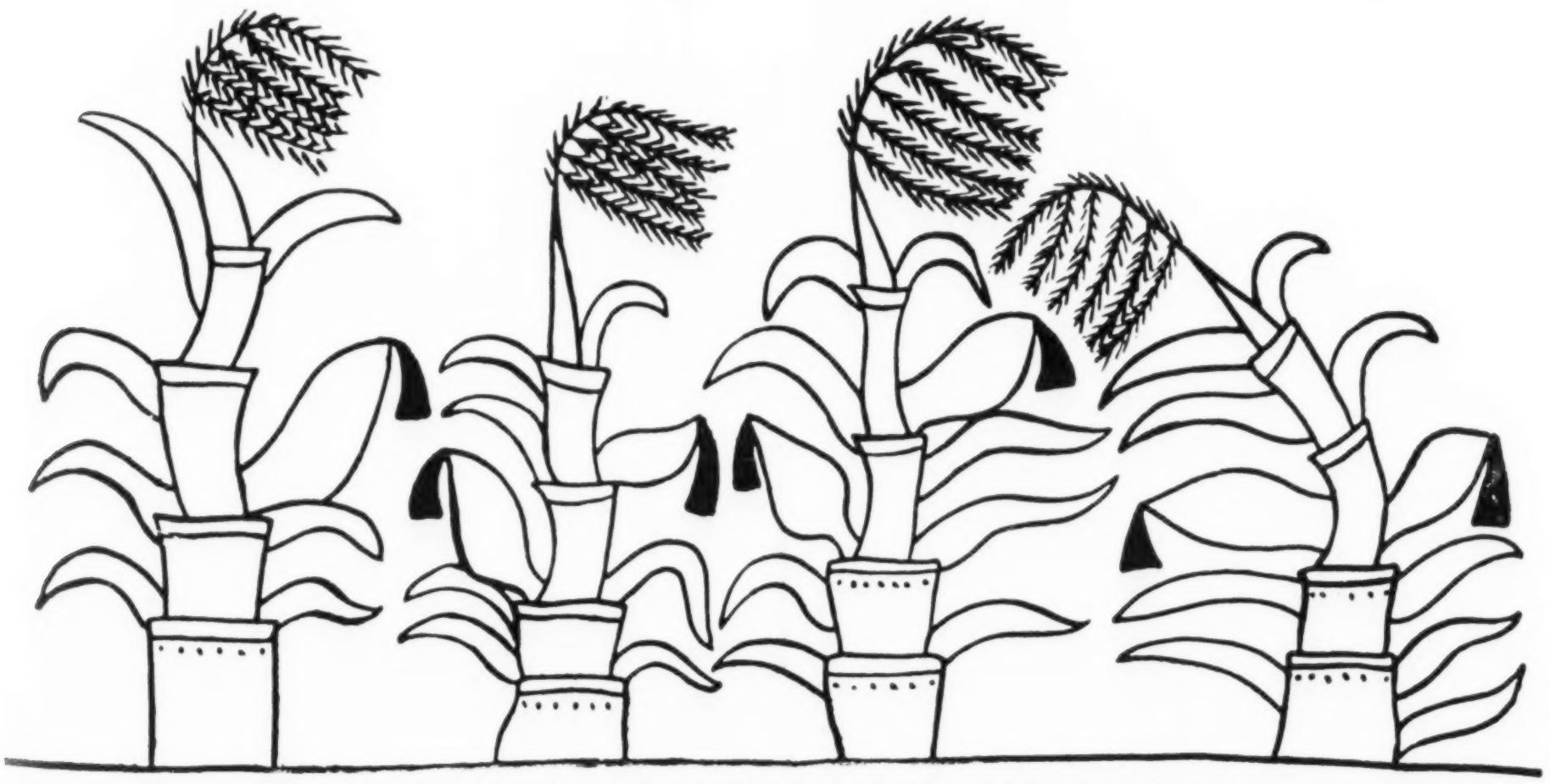
Causing Variations

While notable advances have been made in the last twenty-five years in establishing the basic principles of heredity, as yet only the inheritance of the variations after they occur, is known. But what makes them appear? That remains a great biological mystery, but one that may be solved by sufficient study. We do know that in some organisms new characters occur when accidents in the mechanics of cell division result in one or more extra chromosomes being included in a single germ cell. This would seem to imply that the chromosome balance is an important feature though we can not convert such results into a universal law, for extra chromosomes may occur without apparent alteration in the characters of an individual.

Experiments have shown that by proper exposure of the germ cells to X-rays, or to other unusual treatments, the mechanics of cell division can be so interfered with as to cause unequal distribution of the chromosomes to the two halves of a dividing cell. Here we are on the threshhold of producing variations, though we know that variations are occurring all about us without these special treatments.

The present-day emphasis of biological research lies in attempting to produce heritable variations by artificial methods which will permit repetition at will. Eventually success will crown these efforts and another important phase of life will be under the control of man.

These are problems for future solutions and to these solutions the maize plant may be expected to contribute, as in the past it has contributed to the solution of other problems of heredity. That the controlled production of new characters offers untold possibilities for the future well-being of man, not only with respect to his diet but also in its eugenic aspects, needs no emphasis. And it is a pleasing thought to entertain, that maize may become a sort of beneficent Frankenstein, developed by man first in supplying his material wants and later serving for his intellectual advancement.



MAIZE PLANTS AS FORMALIZED FOR POTTERY

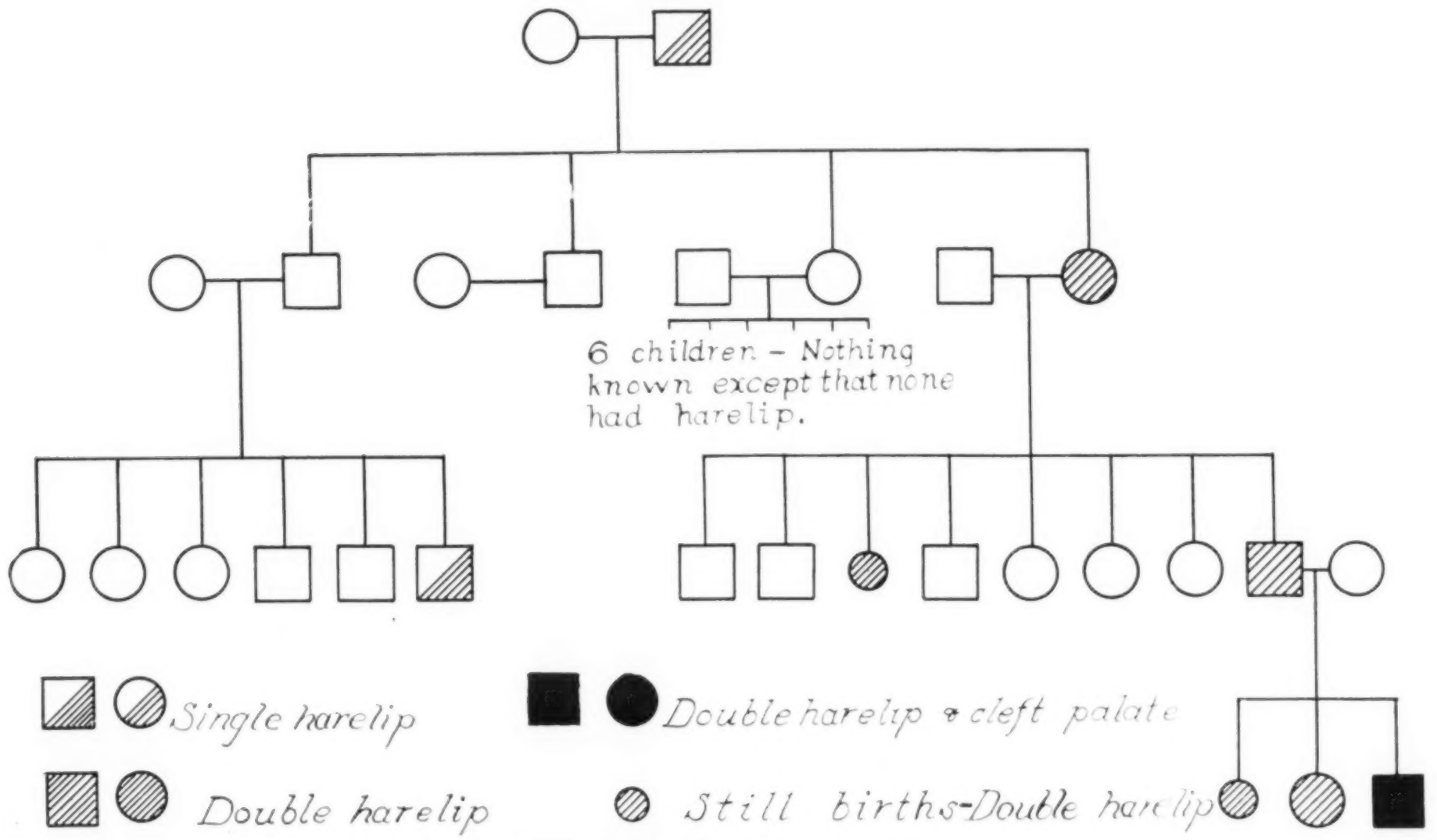
Figure 18

Decorations produced by ancient people who preceded the Incas. This drawing, copied by Dr. Walter Lehman, was found on a clay vessel from the valley of Chicama, Peru.

(*"The Art of Old Peru," by Walter Lehman. Published by Ernest Benn, Ltd. London,* 1924)

FOUR GENERATIONS OF HARELIP

RUTH MASON
University of Virginia Hospital, University, Virginia


6 children – Nothing known except that none had harelip.
Single harelip
Double harelip
Double harelip • cleft palate
Still births-Double harelip

INHERITANCE OF HARELIP

Figure 19

The case recently reported by Cunningham in this Journal (Vol. 15, No. 9), suggested that harelip might be a simple recessive. In this family a more complex situation is indicated.

DURING the past two years two babies of the same parentage, each showing harelip, have been patients in this hospital. One, a girl, born here in January, 1923, showed a double harelip with no cleft in the hard palate. The other, a boy, admitted on the surgical service at the age of 27 days, showed a double harelip and a cleft palate. Three-and-a-half years ago the mother's first pregnancy terminated at full term in a still birth of a female child, who had a double harelip.

Investigation of the family revealed the following facts:

(1) There was no harelip in the mother's family.

(2) The children's father possessed a double harelip, harelip having also been present in his mother, his maternal grandfather, one cousin and a sister.

Detailed study of the family shows that the first case noted was Mr. S., great grandfather of the children observed. He possessed a single harelip. His offspring numbered four, of whom one, a daughter, had a double harelip. The other three appeared normal. Of these, one was the father of six children, one of whom bore a unilateral harelip. The remaining five appeared normal.

The second son has no children after sixteen years of married life.

The normal daughter gave birth to six normal children.

The daughter with the harelip was the mother of eight children, six of whom were normal, while two were defective. One of these, the possessor of a double harelip, is the father of the babies observed.

In no case were the parents consanguineous.

INTELLIGENCE AS A MENDELIAN CHARACTER

A Suggestion Concerning the Mode of Inheritance of Mental Ability

HARRISON R. HUNT
Michigan State College

CIVILIZATION is dependent upon human intelligence; if intelligence deteriorates, civilization also will deteriorate. Some of the most important, if not the most important, problems in the whole range of science are those which concern the physiology and genetics of human mental phenomena. The realization of this fact prompts the present attempt to formulate a hypothesis which may serve as a guide in further investigations on the inheritance of mental ability. *The view elaborated here is not set forth as a demonstrated fact, but merely as a suggestion.* It is scarcely necessary to cite the work of Galton, Pearson, Woods, Thorndike, Davenport, etc., as proof that heredity plays a very important part in the determination of mental ability. Thorndike[10] remarks pointedly, "Of the score or more of important studies of the causes of individual differences which have been made since Francis Galton led the way, I do not find one that lends any support to the doctrine of human initial equality, total or approximate. On the contrary, every one of them gives evidence that if the thousand babies born this week in New York city were given equal opportunity they would still differ in much the same way and to much the same extent as they will in fact differ." One should not overlook the obvious fact, of course, that experience and schooling do count in the development of mentality.

Any theory concerning the mode of inheritance of intelligence must explain: (1) its fluctuating character, (2) why the feeble-minded breed feeble-minded, (3) the occasional normal progeny of feeble-minded parents, (4) the feeble-minded offspring of feeble-minded × normal matings, (5) the occasional feeble-minded issue of normal parents, (6) why mediocrity as a rule breeds mediocrity, though occasionally ability of a high order, and (7) the frequency with which certain strains produce persons of eminence or genius.

Results of Investigation

With one or two possible exceptions, the above situations have been demonstrated, as follows. (1) The fluctuating character of mental capacity is shown by an examination both of the feeble-minded and of the normal. Goddard[9] in his extremely interesting and instructive work on feeble-mindedness, describes about 150 persons eighteen years of age and older, whose mental deficiency is probably due to heredity. Of these about 11 per cent seem to be idiots, 50 per cent imbeciles, and 39 per cent morons. The army mental tests[12], whatever defects they may have, nevertheless bring out quite clearly the fact of variation within the range of so-called "normal" intelligence. The classroom experience of teachers forces the conviction that all "normal" persons do not function with equal facility.

(2) It is a well known fact that if the two parents are feeble-minded, a large majority of the children will

likewise be defective. In 144 matings where father and mother were feeble-minded, Goddard found 476 feeble-minded offspring and 6 normals. Danielson and Davenport[2], in their study of the Hill Folk, observed that in the classes of matings comprising two feeble-minded parents, 77.3 per cent of the children were defective.

(3) A statement which may be open to question is that two feeble-minded parents may sometimes have normal children. A serious difficulty in the way of establishing this proposition is the by no means remote possibility that such normal persons are the illegitimate issue of the defective wife and a normal man who is not her husband. I state the facts for what they may be worth. As mentioned above, Goddard discovered six normal offspring where both parents were defective; 22.7 per cent of the issue observed by Danielson and Davenport in such crosses were apparently not feeble-minded. An examination of the charts and descriptions in the monograph on the Hill Folk[2] shows that out of 103 children, both of whose parents were defective, there were 24 apparently normal ones. Eighteen of these were still children or youths, or were described as backward, so that possibly their normal mental status was not definitely established. This leaves six persons who were apparently normal issue of feeble-minded parents.

(4) The work of Danielson and Davenport, as well as of Goddard, proves that matings between the feeble-minded and the normal may produce mentally defective children. Goddard's 140 unions of this character gave 193 feeble-minded and 212 normal children. Danielson and Davenport found that in such matings from 37.5 per cent to 53.6 per cent of the progeny were defective.

(5) The same investigators have demonstrated, further, that in certain families two normal parents may bear mental defectives.

(6) If heredity plays an important rôle in conditioning mental capacity at the lower end of the intelligence scale, it is reasonable to suppose that it is equally effective at the upper levels. Galton's studies on the able families of England[5] and Woods' work on European royalty[11] demonstrate that ability "runs in families," and is therefore no doubt to a large degree determined by heredity.

Such are the facts. How are they to be explained genetically? Mendel's Law, so illuminating elsewhere, probably furnishes the solution. Goddard has contended with a measure of plausibility that feeble-mindedness is a recessive unit character. I am unable to accept this explanation. In the first place, Goddard assumes that half the normal persons in certain groups he studied are homozygous and half heterozygous for normality. This assumption seems to be unsupported by facts. Secondly, such a simple hypothesis explains neither the variations in feeble-mindedness nor normality. Apparently we must turn to some corollary of Mendel's Law for a more satisfactory explanation. Popenoe and Johnson[8] suggest that several Mendelian factors may be involved in the development of mental characters. The multiple factor hypothesis looks promising.

The Multiple Factor Hypothesis

This hypothesis assumes that a variable character may be the result of several independent factors, each producing a somatic effect similar to the others. The hypothesis has been used to explain the inheritance of a variety of characteristics in highly dissimilar organisms, as in the pioneer work of Nilsson-Ehle on oats and wheat; East and Hayes[3], and Emerson and East[4] on maize; Phillips[7] on size in ducks; Punnett and Bailey[9] on weight in fowls; and Castle[1] in rabbits. Emerson and East in their work on maize studied the inheritance of numbers of rows per ear, of ear length, diameter

of ears, weight of seeds, breadth of seeds, height of plants, number of nodes per stalk, internode length, number of stalks per plant, total length of stalks per plant, and of duration of growth. Castle's investigations of Polish, Himalayan, and Flemish rabbits covered the inheritance of weight, of ear-length, of dimensions of the skull, and the lengths of the tibia, femur, and humerus. Castle's "Genetics and Eugenics"[1] presents a very clear discussion of the multiple factor hypothesis. The hypothesis, therefore, is supported by considerable experimental data.

I have provisionally and arbitrarily assumed that five pairs of equivalent, non-linked, Mendelian factors are involved in the inheritance of mental ability (Table I). There may actually be more and there are possibly less. The complete absence of any factors for intelligence is assumed to create an idiot, one factor when present an imbecile, and two a moron. Some germinal variation in the number of factors has been provided for in the low average, average, and high average grades, in that low average is assumed to be caused by either three or four intelligence factors, average by five or six, and high average by seven or eight such factors. Nine intelligence factors give an eminent man, and ten a genius. We may think of a genius as a rare, usually well-balanced individual whose work initiated some great change in human thought or affairs: Aristotle, Darwin, Newton. Eminent men would be those whom we ordinarily characterize as famous. The "successful" men would be for the most part high average types. The low average grade would be equivalent to what we think of as "dull normal." Thorndike[10] has very briefly suggested a theory similar to the above, though he assumes that the factors vary greatly in their quantitative effects.

Table II shows the consequences that logically follow from forty-seven crosses. One hundred and twenty-five matings were originally worked out, involving all possible crossings between the genotypes within each grade of intelligence, as well as between each grade and those grades immediately above and below it. It is likely that this scheme would cover the great majority of crosses. To restrict the tabulated material to reasonable limits, about every third cross has been selected from the original list for Table II. The theoretical range in variation within a family would depend in large measure upon the parental genotypes; sometimes the variation among the children would be zero, sometimes very wide. As the intelligence of the parents rises, so in general would that of the children, though the extreme ranges among the children might far exceed or fall short of the ability of the parents. The filial mode follows closely the parental type throughout the series.

How nearly do the logical consequences of our hypothesis agree with the facts? In the first place the theory furnishes an adequate factorial explanation for all grades of mental ability, from the idiot to the genius. It does not ignore the existence of variations among either normal or feeble-minded. Neither does it set up a sharp arbitrary boundary between normals and defectives.

According to this theory crosses confined to idiots and imbeciles would never have normal issue (Table II). But Danielson and Davenport cite as normal three children (6, 10, and 14 years of age) whose parents were both "low grade" mentally. It seems to me that the youth of these children casts doubt on the certainty of the statement that they are normal. Theoretically matings restricted to imbeciles and morons would produce from none to 31.3 per cent normal (low average) children. In this connection 12 normal children of feeble-minded parents (6 from Goddard's work and 6 from Danielson and Davenport's)

have been cited. There is an agreement, therefore, between fact and theory. This agreement is suggestive. However, the numbers are small. Consequently further research is needed concerning the alleged normal children of defective parents. The mating of morons with low average individuals would as a rule result in both normals and defectives (Table II). Here again this theory agrees with the facts as ascertained by Goddard, Danielson, and Davenport.

According to our hypothesis matings between normal persons may have feeble-minded issue. Note the large percentages of feeble-minded in the low average × low average types of crosses. Once more the hypothesis agrees with fact.

The percentage of feeble-minded children decreases in Table II until when the average × average crosses are reached not far from a mean value of one or two per cent of the offspring are mentally defective. Is it not possible that the occasional feeble-minded child which is found in families whose history shows no trace of the defect, is the victim of a rare combination of factors such as are shown in our average × average matings? Goddard discovered a few unaccountable cases of this sort.

Turning now to the eminent and men of genius, we find a very remote possibility of an eminent man being produced in a cross between low average and average persons. The average × average type of mating furnishes the first opportunity for producing a genius. May it not be that eminent men like Lincoln have actually risen very rarely from mediocre stock?

Note the very large percentages of high average persons in families where one or both parents are high average. Observe the rising proportion of eminent children as the parental ability increases. Geniuses are theoretically rare except in matings involving parents of a very high order; it is needless to point out that such matings are exceedingly scarce. A logical consequence of this hypothesis is that families which consist mainly of high average persons are likely to produce many notable people. It is clear that our theory meets the final test of its validity in that it logically explains how capacity of a high order recurs in certain families.

This hypothesis, I believe, merits consideration by those who would seek an explanation for the inheritance of the various grades of mental capacity. The details are provisional. Possibly more than ten factors are involved, possibly less. Linkage may or may not be present. The influence of environmental factors, such as educational opportunity, doubtless compli-

TABLE I—Classification of Grades of Intelligence on Five Factor Basis

Idiot	0 factors	aabbccddee
Imbecile	1 factor	Aabbccddee
Moron	2 factors	AAbbccddee
Low average	3-4 factors	AABbccddee AABBccddee
Average	5-6 factors	AABBCcddee AABBCCddee
High average	7-8 factors	AABBCCDdee AABBCCDDee
Eminent	9 factors	AABBCCDDEe
Genius	10 factors	AABBCCDDEE

TABLE II—Inheritance of Intelligence on Basis of Five Factor Hypothesis

PARENTS		CHILDREN (PERCENTAGES)							
Types	Genotypes	Idiot	Imbecile	Moron	Low av.	Av.	High av.	Em.	Gen.
Idiot x idiot	aabbccddee x aabbccddee	100.0							
Imbecile x imbecile	Aabbccddee x Aabbccddee	25.0	50.0	25.0					
Imbecile x moron	Aabbccddee x AaBbccddee	12.5	37.5	37.5	12.5				
Moron x moron	AAbbccddee x AAbbccddee			100.0					
"	AaBbccddee x AaBbccddee	6.3	25.0	37.5	31.3				
"	AAbbccddee x AaBbccddee		25.0	50.0	25.0				
Moron x low av.	AAbbccddee x AaBbCcddee		12.5	37.5	50.0				
"	AAbbccddee x AABbCcddee			25.0	75.0				
"	AaBbccddee x AaBbCcddee	3.1	15.6	31.3	46.9	3.1			
"	AaBbccddee x AaBbCcDdee	1.6	9.4	23.4	54.7	10.9			
Low av. x low av.	AaBbCcddee x AaBbCcddee	1.6	9.4	23.4	54.7	10.9			
"	AABbccddee x AaBbCcDdee		3.1	15.6	62.5	18.8			
"	AaBbCcddee x AaBbCcDdee	0.8	5.5	16.4	54.7	21.9	0.8		
"	AABBccddee x AaBbCcDdee			6.3	62.5	31.3			
"	AaBbCcDdee x AaBbCcDdee	0.4	3.1	10.9	49.2	32.8	3.5		
Low av. x average	AABbccddee x AABbCcDdee			6.3	62.5	31.3			
"	AABbccddee x AaBbCcDdEe		1.6	9.4	54.7	32.8	1.6		
"	AABbccddee x AABBCcDdee				50.0	50.0			
"	AaBbCcddee x AaBbCcDdEe	0.4	3.1	10.9	49.2	32.8	3.5		
"	AaBbCcddee x AABbCcDdEe		0.8	5.5	43.8	43.8	6.2		
"	AABBccddee x AaBbCcDdEe			3.1	46.9	46.9	3.1		
"	AABBccddee x AABbCcDdEe				31.3	62.5	6.3		
"	AABbCcddee x AaBbCcDdEe		0.8	5.5	43.8	43.8	6.3		
"	AABbCcddee x AABbCcDdEe			1.6	32.8	54.7	10.9		
"	AaBbCcDdee x AaBbCcDdEe	0.2	1.8	7.0	41.0	41.0	8.8	0.2	

PARENTS		CHILDREN (PERCENTAGES)							
Types	Genotypes	Idiot	Imbecile	Moron	Low av.	Av.	High av.	Em.	Gen.
Average x average	AABBCcddee x AABBCcddee				25.0	75.0			
"	AABbCcDdee x AABbCcDdee			1.6	32.8	54.7	10.9		
"	AaBbCcDdEe x AaBbCcDdEe	0.1	1.0	4.4	32.2	45.1	16.1	1.0	0.1
"	AABBCcddee x AABbCcDdEe				18.8	62.5	18.8		
"	AABbCcDdee x AABbCcDdEe			0.8	21.9	54.7	21.9	0.8	
"	AaBbCcDdEe x AABbCcDdEe		0.2	1.8	23.4	49.2	23.4	1.8	0.2
"	AABBCCddee x AABbCcDdEe				6.3	62.5	31.3		
"	AABbCcDdEe x AABbCcDdEe			0.4	14.1	49.2	32.8	3.1	0.4
Average x high av.	AABBCcddee x AABBCCDDee					50.0	50.0		
"	AABbCcDdee x AABBCcDdEe				10.9	54.7	32.8	1.6	
"	AaBbCcDdEe x AABBCCDdee				10.9	54.7	32.8	1.6	
"	AaBbCcDdEe x AABBCCDdEe				6.3	43.8	43.8	5.5	0.8
"	AABBCCddee x AABBCCDDee						100.0		
"	AABBCcDdee x AABbCcDdEe				3.1	46.9	46.9	3.1	
"	AABbCcDdEe x AABBCCDdee				3.1	46.9	46.9	3.1	
"	AABbCcDdEe x AABBCCDdEe				1.6	32.8	54.7	9.4	1.6
High av. x high av.	AABBCcDdEe x AABBCcDdEe				1.6	32.8	54.6	9.4	1.6
"	AABBCcDdEe x AABBCCDDee					12.5	75.0	12.5	
"	AABBCCDDee x AABBCCDdEe						75.0	25.0	
High av. x eminent	AABBCcDdEe x AABBCCDDEe					6.3	62.5	25.0	6.3
Eminent x eminent	AABBCCDDEe x AABBCCDDEe						25.0	50.0	25.0
Eminent x genius	AABBCCDDEe x AABBCCDDEE							50.0	50.0

cate the problem. Perhaps not all the factors are qualitatively and quantitatively alike. Yet a theory of the multiple factor type will doubtless in time be found to explain variations in mental ability, just as fluctuations in size among plants and animals are now explicable on the same basis.

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The Negro Death Rate in Cincinnati

The death rate last year among Cincinnati's negroes was almost double that among its white population; in the previous year the death rates were 15.1 and 26.3 per thousand inhabitants, respectively, and in 1922, 14.2 and 22.5. While the negroes of Cincinnati constitute only about 9 per cent of the population, they contribute 28 per cent of the deaths from tuberculosis; more than four times as many colored people as white people die of tuberculosis per thousand population. Of the colored children, almost three times as many of them die during the first year of life as among the white children. Negroes contributed more than 70 per cent of the smallpox in the city last year; yet in one school (the Harriet Beecher Stowe School, which is exclusively for colored children) there was no smallpox because the children had been vaccinated.—*Journal of the American Medical Association,* October 24, 1925. P. 1313.

BUD SELECTION IN THE WASHINGTON NAVEL ORANGE

VI. Progeny Test of a Dual Limb Variation

A. D. Shamel, C. S. Pomeroy and R. E. Caryl
Bureau of Plant Industry, United States Department of Agriculture

SEVERAL striking bud variations of the Washington Navel Orange have been described and their relation to the origin and development of important strains of this variety has been discussed in an earlier publication.[1] Reports on a number of progeny tests of limb variations in trees of the Washington Navel Orange which show marked differences in quantity and quality of fruit production have also been presented.[2] Another illustration of limb variation in the Washington Navel orange and the performance record of progeny trees propagated from a Dual limb sport in a tree of the Washington strain will be presented in the following paragraphs.

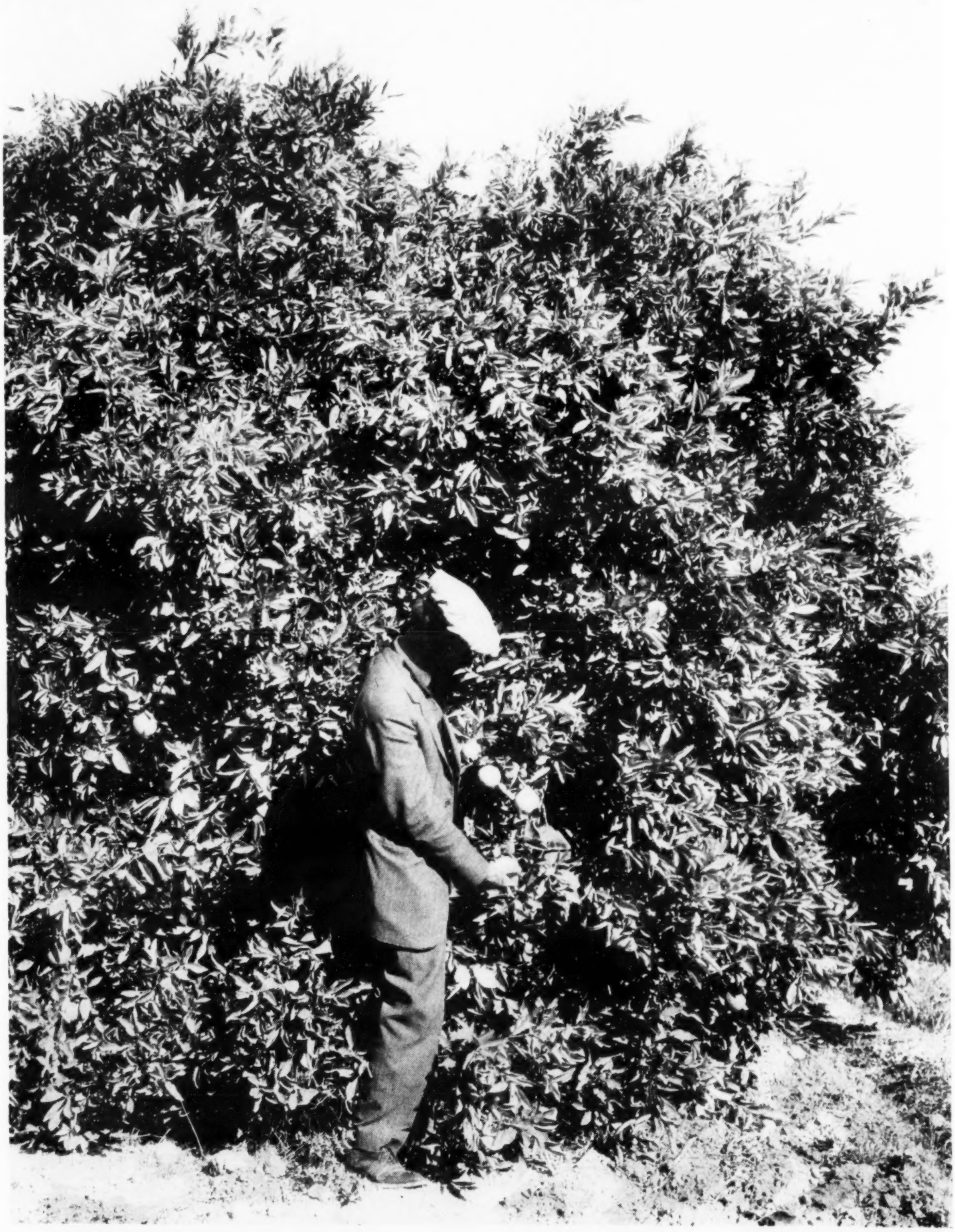
The Dual Limb Variation

The parent tree was found by the senior writer in 1910, in a Washington Navel orange orchard near Corona, California, which was then the property of the National Orange Company and now belongs to the American Fruit Growers, Inc. The trees in this block are of the Washington strain and were planted in 1903. They were grown from buds inserted in Mission Sweet Seedling rootstocks and made a healthy growth with normal production of fruit.

While looking for limb variations in this orchard it was noted that many of the fruits produced by one main limb of this particular tree showed unusual characteristics. The rinds of some of these fruits were smooth and thin on the blossom ends and rougher and thicker on the stem ends while in others this arrangement was reversed. On other fruits an area of smooth thin rind formed a band around the middle zone of the oranges, the remainder being rough, while in others smooth areas occurred as irregular sunken patches near the stem ends of the fruits. In still other instances the fruits were entirely smooth and thin-skinned while in some cases they were wholly rough. The parent tree containing this limb is shown in Figure 20 and fruits from the limb variation are shown in Figure 22.

Further examination of the abnormal fruits produced by this limb variation indicated that the smooth areas corresponded quite closely in appearance to the rind characteristics of fruits of the Thomson strain while the rough areas were similar to the rind characteristics of fruits of the Washington strain. Continued study of these fruits during the past fifteen years has confirmed these conclusions so that it is apparent that the rinds of some of the fruits of this limb variation possess Thomson and Washington strain characteristics on the same oranges while others are wholly typical of the Thompson or of the Washington strain. This condition is somewhat similar to that occurring with other plants which has been explained on the basis of the development of periclinal chimeras. The name Dual has been used to designate this strain because characteristics like the two strains, Thomson and Washington, are here found on the same fruits.

On the remaining limbs of the parent tree the fruits are largely of the Washington strain but some of them are of the Thomson strain. These different types of fruit are not segregated as to limbs so far as observed



PARENT "DUAL" TREE

Figure 20

Washington Navel Orange tree which also bears fruits like the Thomson strain and others showing various mixed patterns of Washington and Thomson rinds, as illustrated in Figure 22.

PROGENY TREES, "DUAL" STRAIN
Figure 21

These progeny trees were propagated in 1915 from a Dual limb variation in the tree shown in Figure 20, and they produce fruits typical of the sporting limb (See Figure 23). Photographed November, 1924.

but occur irregularly on the same limbs and their relative number has varied from year to year.

The limb variation has produced fruits of the Dual strain and of the Thomson and Washington strains each year since it has been under observation. The different branches of the limb have usually borne fruits of all three classes of this strain but no definite studies have been made to determine the relative positions of the different sorts of variations from year to year.

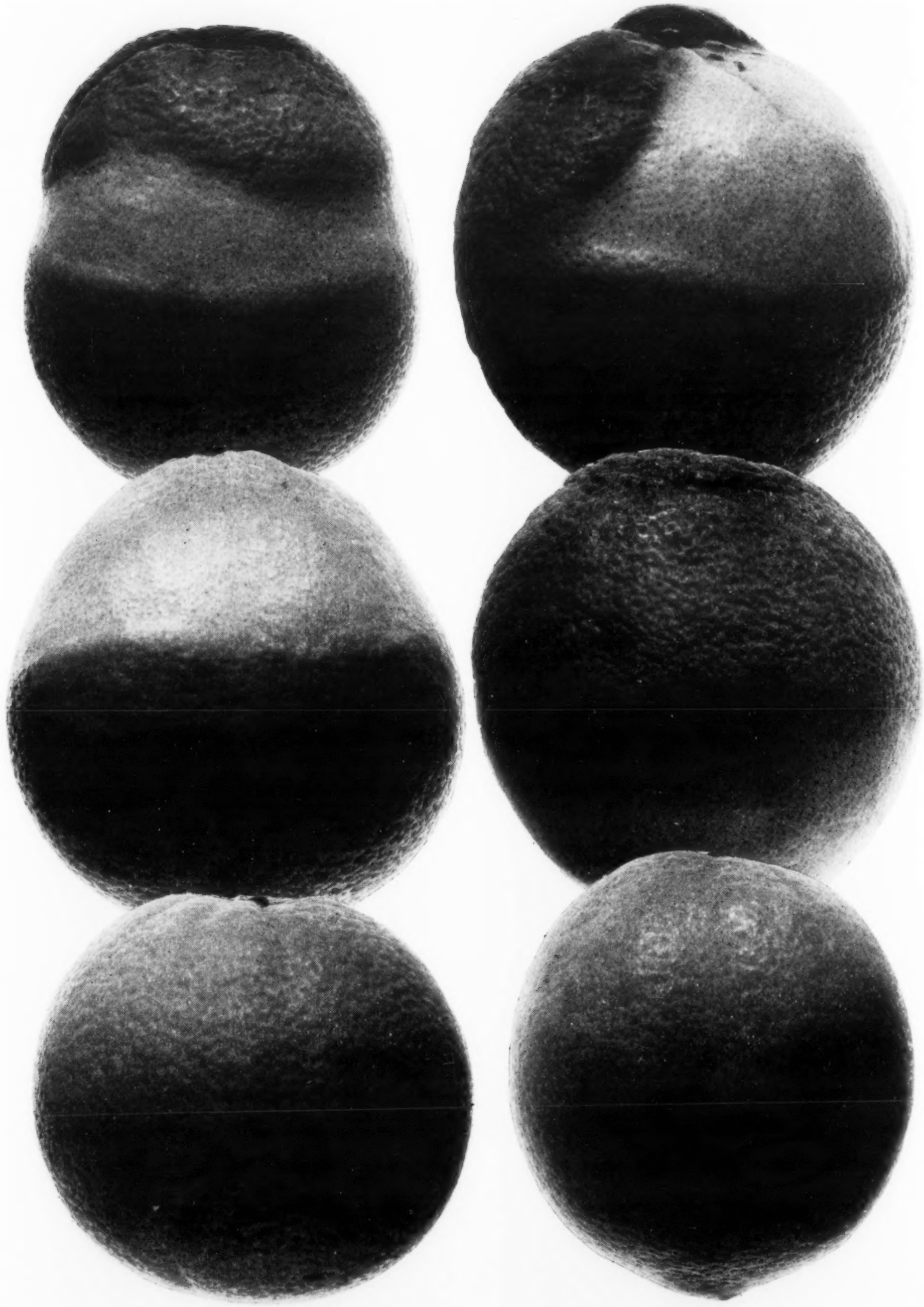
Progeny Propagation

On January 27, 1915, budwood was secured from the Dual limb variation of the parent tree and was later propagated on sour orange seedling rootstocks in a commercial nursery in co-operation with the Citrus Experiment Station of the University of California.

Three nursery trees were grown from this propagation which were transplanted to the progeny test plot in the orchard of the Citrus Experiment Station at Riverside, California, on July 2, 1917. The trees were set ten feet apart in the row along with progeny trees from other limb variations of the Washington Navel orange. Winter and summer cover crops have been grown and plowed under each year in this orchard for soil improvement purposes but no fertilizing material was used until the spring of 1924. The trees have made a normal and healthy growth and produced their first crops of fruit during the season of 1920-21. Two of these progeny trees are shown in Figure 21 and fruits from one of them are illustrated in Figure 23.

Progeny Performance Records

The annual yields of the three



DUAL ORANGES FROM PARENT LIMB

Figure 22

All six oranges are from the sporting limb of the tree shown in Figure 20. The rough-skinned orange (lower left) is a typical Washington fruit; the smooth-skinned fruit opposite appears to be a normal Thomson orange. The others are part Washington and part Thomson.

FRUITS FROM PROGENY TREE

Figure 23

These oranges are from one of the progeny trees shown in Figure 21. As in the case of the parent limb, the fruits are of three kinds—"Dual," entirely smooth-skinned (Thomson), and entirely rough-skinned (Washington).

progeny trees of the Dual strain are shown in Table 1.

Progeny tree 1 has produced a total of 60 oranges of the Dual strain, 178 oranges of the Washington strain and 57 oranges of the Thomson strain during the performance record period of five years, 1920-21 to 1924-25, inclusive.

Progeny tree 2 has produced a total of 97 oranges of the Dual strain, 48 oranges of the Washington strain and 31 oranges of the Thomson strain during the performance record period. This tree had no crop in the season 1924-25. Typical fruits produced by this tree in 1924 are shown in Figure 23.

Progeny tree 3 has produced a total of 160 oranges of the Dual strain, 39 oranges of the Washington strain and 2 oranges of the Thomson strain during the performance record period.

Conclusion

The unstable fruit characteristics of the Dual limb variation of the Washington parent tree have been transmitted to the progeny trees through bud propagation.

These studies suggest the probability that the presence of trees bearing fruit which shows abnormal characteristics is due to the unintentional propagation of limb variations in normal nursery budding.

These results and those previously reported demonstrate the fundamental importance of bud selection in citrus varieties in order to avoid the propagation of unstable and commercially inferior variations.

TABLE I.—Records of annual production of progeny trees propagated from a limb variation of the Dual strain in a tree of the Washington strain of the Washington Navel orange which also bears fruits of the Thomson strain. These progeny trees were planted July 2, 1917.

Strain	Tree No.	Number of fruits produced					
		1920-21	1921-22	1922-23	1923-24	1924-25	Totals
Dual	1	6 D[1]	11 D 26 W	14D 32 W 29 T	28 D 100 W 22 T	1 D 20 W 6 T	60 D 178 W 57 T
	2	3 D 2 W 6 T	14 D 6 W 3 T	18 D 14 W	62 D 26 W 22 T	no crop	97 D 48 W 31 T
	3	1 D 1 W	5 D 5 W	23 D 11 W	119 D 14 W	12 D 8 W 2 T	160 D 39 W 2 T

1. *D* indicates typical fruits of the Dual strain; *W* indicates typical fruits of the Washington strain, and *T* indicates typical fruits of the Thomson strain.

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A Biological Nightmare

DAEDALUS, OR SCIENCE AND THE FUTURE, by J. B. S. HALDANE, Reader of Biochemistry at the University of Cambridge. Pp. 93, Price $1.00. D. P. Dutton and Co., 1924.

One of the "Today and Tomorrow Series" published by Dutton, apparently with the idea of popularizing some of the more complicated sciences. Mr. Haldane undertakes to prophesy what biology will do for mankind, and the result is not very encouraging. Fortunately this is an arm-chair pastime in which almost anyone can indulge. There is nothing inherently impossible in any of his guesses, but those dealing with eugenics reveal a peculiar attitude of mind.

It is to be regretted that it should be thought necessary in a biological treatise to take is for granted that children are disgusting. No doubt this idea may seem natural to those who have failed of a normal existence, and there may be enough people of this sort to justify Haldane's "Apology," in an article prepared for popular publication. But why should a man of such scientific eminence cater to this "deficiency complex" by holding his metaphorical nose while addressing his co-workers at Cambridge* on such an unpleasant subject" as the bearing and rearing of children? How great is the need of eugenic reform when our "best people," and biologists at that, are so sublimated as to dream of laboratory reproduction, and then describe it as an ideal of scientific progress in eugenics!

The lady who said "I don't want my daughters to be married, but I do want to have some grandchildren" might patronize the Haldane Child Factory, but we fear it would soon have to go out of business. If people are to become too intelligent and too over-refined to bear children it is certain that they will not take the trouble to raise them properly, which is vastly more difficult than getting them born. Fortunately there are still intelligent people who are neither disgusted by children nor by the prospect of being parents. It is to be hoped that biology will never reduce the number of these.

As a corollary of factory reproduction Haldane must predicate factory methods of education. The limitations of these are being brought to light in some of our overgrown schools and colleges. Putting the entire human race on an orphan asylum basis can not be considered as a progressive undertaking. One of the great weaknesses of education today is that it stratifies the generations so that social continuity (or as it has been called, *Social Heredity*) is lost. It is hard to see how this peculiarly personal relation is to be replaced by any kind of "system."

There is nothing inherently impossible in any of Haldane's forecasts, but

*The paper was read to the "Heretics" of Cambridge before its publication by Dutton.

do they serve any useful purpose? The time honored excuses for prophecy are to warn or to encourage, and Haldane does neither. He pictures a promised land that few people could be induced to spend much time or energy to attain. His prophecies are too bizarre to be either attractive or terrifying.

The real value of biology is to enable man to study himself in relation to his environment, so that he can avoid the pitfalls that have destroyed former cultures. There are many disquieting similarities between modern conditions and those obtaining in the Roman Empire in the time of Trajan, or in Greece some centuries earlier. The development of the biological sciences is a feature of our civilization as of no other, and the applications of biology now taking shape are practical alternatives of a "decline and fall" of twentieth century civilization.

The time left to apply these remedies may be short, as there are already disquieting symptoms of a plunge to a new "Dark Age." It seems that a more constructive, and a more inspiring prophecy would be to picture this absorbing race between the biologist and Bolshevist. On the one hand we have the forces of disintegration, fatal to all previous cultures, and to which our own is not immune. On the other we have the possibility of the conscious study of civilization as a biological phenomenon, with the hope of eliminating the "lethal factors" and substituting continuous progress for the vicious cycle that now has our social system in its grip. These facts must be understood by intelligent people before the time for action is past. Such a program does not put biological research among the "freak" undertakings, and it is fully as inspiring and quite as "thrillingly unbelievable" as ectogenetic babies and nightless cities.

R. C.

A French View of Eugenics

L'Heredite, by Prof. E. Guyenot. Paris, G. Doin, 1924, pp. 463.

Prof. E. Guyénot has written a small volume in which he has given a clear and fairly comprehensive exposition of the present status of the science of genetics. After a general orienting chapter, there is a discussion of the elements of biometry, and this is followed by a treatment of the laws of Mendelian inheritance, the factorial interpretation of heredity, the doctrine of genes, and the varied phenomena due to the interaction of factors. Book II, which is devoted to the chromosome theory of heredity, contains chapters on the cytological basis of Mendelism, the chromosome interpretation of sex and sex linked inheritance, linkage and crossing-over, the arrangement of factors in chromosomes, and objections to the chromosome theory, including a discussion of characters transmitted through the cytoplasm.

Book III treats of anomalies of Mendelian heredity, the results of crossing different species, mixed and unilateral heredity in species crosses, heredity of sex, and heredity in man. In the appendix to the latter chapter the author explains the relation of modern genetics to telegony, xenia, atavism, and Galton's laws of ancestral heredity and filial regression. There is a bibliography of the more important books and papers on heredity, and, what is especially to be commended in a book written in French, an adequate index.

There is no book with which we are acquainted which gives in so short a space, so clear and satisfactory an exposition of the facts and principles of heredity. The book is well up to date, and exhibits a comprehensive and philosophic grasp of the subject. One noticeable lack in the otherwise well-rounded presentation is the small space devoted to the doctrines of Lamarck. But the author probably holds that Lamarck, however great his influence may have been, belongs now to history.

S. J. Holmes

NEWS AND NOTES

A New Department

UNDER this heading will appear each month items which may be of interest to members of the A. G. A. News notes and editorial comments will both be included. The effect of the latter in moulding public opinion is so powerful that it seems desirable to keep in touch with what the editors are saying.

It will not be possible to verify the statements which appear here and we can therefore not vouch for their accuracy. When matters of especial interest are reported an effort will be made to get a more complete statement from those concerned to be published in a later number of the Journal.

Members are urged to submit notes and clippings which might be included.

The Human Race Getting Too Smart!

Briton Sees World Unfit for Higher Education Level

London, Jan. 1.—Serious congestion in the ranks of white collar workers would result if the general average of intelligence were raised 10 per cent., Professor McDuff, a lecturer at Armstrong College, warned the *Eugenics Educational Society* at its meeting in London today.

"The world," he said, "is not organized or prepared for a much higher level of intelligence than it already has." He declared that even the small percentage of children who go through secondary schools have great difficulty in getting suitable employment in which they can use their higher education.

Educators were urged to abandon the white-collar ideal in education for the "barekneed" ideals of the Boy and Girl Scout movements.

New York Times—Jan 2, 1926.

"Bare-Kneed Ideals"

The highbrow and white-collar ideals must give way to the ideals of the bare knees and horny hands. So declares a British professor to the *Eugenics Educational Society of Great Britain.* The world can't stand much more intelligence, he says. Another lift of the brain level by so little as 10 per cent is going to play hob with the remnants of civilization there are left among us.

There's a reason. Professor McDuff says that the moment young people get an education they hike out for a clean-hand and clean-clothes employment. That is half the reason why we can't take on any more intelligence at the present time with safety. What would happen if every one was educated? All the genteel indoor jobs would be overcrowded, and there would be no one left to do the hard, sweaty work.

The other half of the reason, already stated by implication, is that the graduates of schools and colleges have a forlorn time of it as it is to find the employment suitable to their education and personal tastes. But Professor McDuff goes a step farther than that and declares education should be adapted to the kind of work and the way of life one is to do and live. By that rule he says that the majority of people do not need much education and that any surplus or unused intelligence is not only a burden but a menace. Intelligence above one's station makes the work to which one is condemned more like convict labor than useful employment.

Professor McDuff knows, of course, that his views are not new. Indeed, he must know that they are about the most ancient of all theories of education, the most ancient theory being that education is a bad thing, no matter what the dose. The brain is a disqualifying and disabling adjunct of the natural physical system of man. The lower animals have all kept happily free of its noxious influences, and see how well the lower animals get along. And still the McDuff argument has its points—has had them for some fifty or sixty centuries certainly.

Philadelphia Evening Public Ledger—Jan. 2, 1926.

Fitter Families Again

Lansing, Mich., Jan. 16.—A campaign to get the people of Michigan to fill out records of family traits so the 50 most promising families may be invited to the Michigan State fair next fall to compete in the second annual Fitter Families contest, is announced by Leon F. Whitney, secretary of the *American Eugenics Society*, writing in the Michigan Farmer.

Eventually, he says, the plan is to have a similar contest at every fair in the State.

"The Fitter Families contest held last year at the State fair at Detroit," he writes, "had a big purpose back of it. First, it was to awaken people to the fact that human beings are not above natural law, and that they can be improved in body and mind. Second, it was to interest people in the possibilities of their own bodies and minds, and to help them, especially the children, to discover that they could improve their own minds and bodies, thus improving the family average; also, that they could carry this improvement only to a certain point, which was dependent on their ancestors' qualities. . . .

"In our civilization the individual is not the unit. The family is. This is the result of years of experimentation by mankind. Our distant forefathers tried making the individual the unit, and it didn't prove a success. If the individual were the unit today, the eugenist would be talking about using the same methods to better the human race that the farmer uses to breed better live stock. But the farmer is interested only in producing individual animals of the highest grade, while, because time has proved that the family is the best unit for human beings, the eugenist is interested, not so much in the individual as in the family, and the race of families.

Farms Produce Genius

Mr. Whitney cites figures from Who's Who to show that the farm has been one of the important birthplaces of genius.

"Naturally, the engenist is greatly interested in the farm," he continues. "From it have come a large proportion of the great leaders of America. The average farm family is at least sufficient to carry on the goodly heritage, while the average city family is too small. Farmers, too, grasp the true meaning of the word eugenics. They know that race betterment is possible, because they have bettered the races of their own animals. They know that eugenics means all that is best in life. It is not necessary to explain to the farmers that eugenics does not mean birth control or sex hygiene or free love or trial marriage. "In fact, since the family is the unit, and since love is the cementing tie of the family, eugenics stands for more love in marriage. It means ridding society of defectives because they are not only a burden to society, but because they are a burden to themselves. It's no fun to be insane and to stay in an institution all one's life, or to be a criminal and stay in jail. It's much more fun to be

healthy in body and mind. So, for the sake of those who come after us, we must improve our families. This is practical, reasonable, and the farmer sees that it is possible."

Just Race Horses

Mr. Whitney likens the record of family traits filled out by each family which took part in the contest in September to the pedigree of a race horse.

"In the horse's record," he says, "is recorded the time in which that horse ran or trotted a mile. If he were a three-minute horse and his owner wanted to breed fast horses that would win races, the owner would sell his three-minute horse to work on a grocery cart, and breed to some great horse—Fair Play, for example. Why? Because Fair Play has a fine record and all of Fair Play's family are fast horses. In the record of family traits the characteristics which reappear in the different generations are shown. A study of it will show what qualities should be sought and what avoided in the families into which its members marry."

The records to be sought in the campaign will furnish in advance the score in heredity, and the only task remaining to the staff at the fair will be to score the families on their physique and mentality to determine which is the best family in Michigan.

No Human Pedigrees

"The value of the plan," continues Mr. Whitney, "lies in the fact that it affords a possibility which everybody has wished for—namely, to put his pedigree on record where it will be kept safe and confidential. We keep excellent pedigrees of our livestock and seem to have thought last of our own pedigrees, which should some first.

"The old-fashioned genealogy is now proving to be of little worth, because the compiler listed only names, in his effort to trace back to the Mayflower or William the Conqueror, or some other notable. This was done through one ancestor only. By the time we get back to old William, we find that we had over 17,000,000 ancestors in that generation alone and William wasn't any more important to us than the least of the others. What a genealogy should give is all the most minute details about each ancestor. The record of the family traits is the new genealogy. It should be filled out by everybody who is interested in the future of his or her family, and that means everyone who is interested in the future of America."

Grand Rapids Herald—Jan 17, 1926.

Certified Families

The movement for finer and fitter families, as started by the *Eugenics Society of the United States of America*, holds a promise of social reorganization. The idea is to allow families of satisfactory health history and heredity to obtain credentials to distinguish them from those other families which cannot come up to the high eugenic level. In other words we are to have certified families even as we have certified milk and certified public accountants.

Right away the thought comes that the certified families are going to feel a bit high hat and uppity but if there must be class lines and social distinctions, it might be a lot better to have them drawn upon the lines of the eugenists than upon money or the fact that one's second cousin once danced with the Prince of Wales.

* * *

The new certified families, as we see it, can get into any club or drawing room upon presentation of their certificates. They will be the aristocrats of the future and whenever they offend against the laws of state or nation will be punished by having their certificate cancelled.

* * *

Though you are certified, I know
I do not like you, Richard Roe;
You may be all your papers say,
I do not like you, anyway.

Oakland (Cal.) Tribune—Jan 12, 1926.

The Church and Eugenics

The Protestant church should stop catering to intellectual morons and address itself to the minority of our population which has the intellect to appreciate the present social situation and effect remedies. That was the starting thesis of Harold Ehrensperger, a Garrett Biblical institute student and leader of the youth movement in the Protestant churches, developed recently before the thousand students from several score dormitories and most of the colleges of the country who are considering the church and the social order at the interdenominational student conference in the First Methodist Episcopal Church in Evanston today and tomorrow.

"If the thoughtful and intelligent people of the community can be won to the church, that institution will be in a position to tackle and solve the problems of such maladjusted groups as the insane, the feeble minded, the criminal, the defectives who are now increasing at an appalling rate," Ehrensperger told his youthful hearers. "In fifty years the population of the country has increased 170 per cent, while the criminal classes have increased 440 per cent. Eugenics rather than economic causes are responsible and it is time the church tackled the problem of eugenics. Instead of going out into the byways and slums to rescue the perishing in the words of the hymn we should ascertain just who is perishing and who is fit to care for the perishing. Otherwise we will be submerged with a race of morons.

Urges Birth-Control Clinics

"The church will not be fulfilling its mission until it has birth-control clinics, psychiatric service which will assist its people with their behavior problems and other maladjustments and thus make possible a healthier and happier race. Intelligent people working through the church will see that the permanently maladjusted are cared for in institutions and their kind not reproduced, so that succeeding generations will be sound physically, mentally and morally capable of the highest things in religion.

"The morons probably need religion, but Protestantism has little to offer them. They will get more out of a ritualistic impressive form of worship than one which challenges the mind as well as the eye. No church makes people good. Good people make a church. The church is failing today because church-going people are bred less frequently than in other times. We must improve the breed."

Ehrensperger supported his arguments with statistical exhibits prepared in researches he is conducting in the Juvenile Court and other institutions for delinquents. He said that his social studies convinced him of the desirability of the church supplying human needs growing out of such contemporary social phenomena as divorce and the consequent breakup of the home.

"The conquest of these social situations is a task worthy of the best brains of our generation. It offers a moral equivalent for war, which William James said was necessary before war could be banished from the earth."

Chicago News—December 31, 1925.

Brooklyn Pastor Favors Eugenics

The wide dissemination of a knowledge of eugenics received commendation from a Brooklyn clergyman last night when the Rev. Fritz W. Baldwin, pastor of the Clifton Avenue Congregational Church, spoke before the forum of the Eighth Avenue Temple on the topic "How Can We Interest Young People Religiously?"

In response to a question as to the compatibility of eugenics and religion, Mr. Baldwin answered: "I believe that eugenics is a subject that might well be presented from the pulpit." During his speech Mr. Baldwin stated that the modern young person was more interested in eugenics than in religion.

Brooklyn Citizen—Jan. 23, 1926.